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(54) Title: A PLANT TRANSCRIPTION FACTOR THAT IS INVOLVED IN SUGAR SIGNALLING

(57) Abstract: Provided are nucleotide sequences which encodes a sugar-signalling transcription factors capable of activating a promoter of a gene encoding an enzyme involved in the synthesis or deposition of starch e.g. in response to sugar levels in a plant. Preferred sequences encode WRKY proteins such as the sugar signaling in barley2 (SUSIBA2) factor and variants thereof, and act on promoters which comprise at least one SURE element and/or W box element to which the transcription factor binds (e.g. promoters such as *isol*, *sbel*, *sbellb*, *ssl*, *agpaseS*). The invention also provides related methods and materials e.g. for activating, modulating, and investigating the elements present in such promoters.



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INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7. C12N15/82 A01H5/00 C07K14/415 C12N5/10 C12N15/29

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N A01H C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, Sequence Search, PAJ, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/49840 A (RAFALSKI J ANTONI ; DU PONT (US); ZHU QUN (US); FAMODU OMOLAYO O (US)) 12 July 2001 (2001-07-12) page 2, line 1 - line 24 figures; examples	1-37
X	US 2002/076775 A1 (HU XU ET AL) 20 June 2002 (2002-06-20) paragraph '0004! - paragraph '0016! paragraph '0057! - paragraph '0058! examples sequence listings	1-32, 36, 37

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
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- *O* document referring to an oral disclosure, use, exhibition or other means
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- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PC/GB 03/05245

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 01/35725 A (RIECHMANN JOSE LUIS ; PINEDA OMAIRA (US); ADAM LUC (US); JIANG CAI ZHO) 25 May 2001 (2001-05-25) page 1, line 11 - line 28 page 3, line 12 - page 4, line 6 claims; figures	1-4, 7-32, 36, 37
X	RIZHSKY LUDMILA ET AL: "The combined effect of drought stress and heat shock on gene expression in tobacco." PLANT PHYSIOLOGY (ROCKVILLE), vol. 130, no. 3, November 2002 (2002-11), pages 1143-1151, XP002276561 & ISSN: 0032-0889 page 1147, column 1, paragraph 2 page 1149, column 2, paragraph 1 page 1149, column 2, last paragraph	1-4, 7-32, 36, 37
X	ARENAS-HUERTERO FRANCISCO ET AL: "Analysis of Arabidopsis glucose insensitive mutants, gin5 and gin6, reveals a central role of the plant hormone ABA in the regulation of plant vegetative development by sugar" GENES AND DEVELOPMENT, vol. 14, no. 16, 15 August 2000 (2000-08-15), pages 2085-2096, XP002276562 & ISSN: 0890-9369 page 2093, column 1, last paragraph - page 2094, column 1, paragraph 2	1, 7-32, 36, 37
P, X	SUN CHUANXIN ET AL: "A novel WRKY transcription factor, SUSIBA2, participates in sugar signaling in barley by binding to the sugar-responsive elements of the isol promoter." THE PLANT CELL. SEP 2003, vol. 15, no. 9, September 2003 (2003-09), pages 2076-2092, XP002276563 ISSN: 1040-4651 the whole document	1-32, 36, 37
P, X	WO 03/013227 A (CREELMAN ROBERT A ; RIECHMANN JOSE LUIS (US); PINEDA OMAIRA (US); ADAM) 20 February 2003 (2003-02-20) page 117, paragraph 3 - page 118, paragraph 2 page 140, paragraph 2 claims 65, 66 table 4, #761 - #799	1-4, 7-32, 36, 37

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 03/05245

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-4 (all partially), 5 (completely), 6-32 (all partially)
36 (completely), 37 (partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/ GB 03 /05245

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1 - 4, (all partially), 5 (completely), 6 - 32 (all partially), 36 (completely), 37 (partially)

relating to a transcription factor from barley that is involved in sugar signalling and to methods employing said factor.

2. claims: 1 - 4, 6 - 32 (all partially)

relating to a transcription factor from wheat that is involved in sugar signalling and to methods employing said factor.

3. claims: 1 - 4, 6 - 32 (all partially)

relating to a transcription factor from rice that is involved in sugar signalling and to methods employing said factor.

4. claims: 33 - 35 (all completely), 37 (partially)

relating to a method for promoter analysis.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/05245

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